Name _____ Date _____ Block _____

Mitosis Lab – 15 Points

Data Table = 10 points Questions = 1 point each

Due Date: _____

Introduction: This lab is pretty straightforward… You will observe slides of the root tips of onion cells and calculate the relative percentage of time the cell spends in each phase. These observations will also be helpful for the "plant" portion your mitosis flipbooks! This will also be the first time using the microscopes *in this class* so please ask for assistance if needed ☺

Objectives:

1. Become more familiar with the stages of mitosis in plant cells.
2. Calculate the amount of time a cell spends in each part of the cell cycle.
3. Compare & Contrast mitosis in animals and plants.

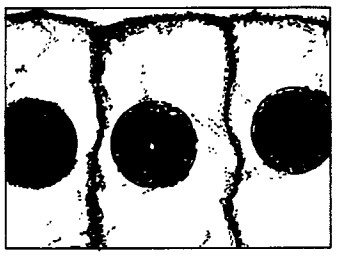
Procedures: See next page

Procedure

Examine prepared slides of longitudinal sections of onion root tips using the 10X objective. Locate the meristematic region. Using the 40X objective, examine individual cells in this region to study the phases of plant mitosis. Find the stages described below.

1. The nondividing cell is in a stage called **interphase**. The **nucleus** may have one or more dark-stained **nucleoli** and is filled with a fine network of threads, the **chromatin**. **Interphase** is essential to cell division because the genetic material (DNA) is duplicated (replicated) during this stage (Figure 3.2).

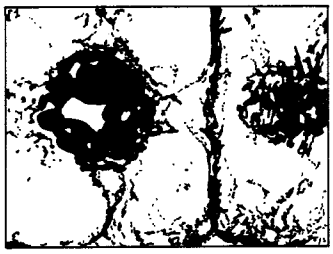
Figure 3.2



Interphase

2. The first sign of a division is **prophase**, in which a thickening of the chromatin threads occurs. Thickening continues until it is evident that the chromatin has condensed into **chromosomes**. With somewhat higher magnification you may be able to see that each chromosome is composed of two **chromatids**. As prophase continues, the chromatids continue to shorten and thicken. In late prophase the nuclear envelope and nucleoli are no longer visible, and the chromosomes are free in the cytoplasm. Just before this time the first sign of a spindle appears in the cytoplasm; the spindle apparatus is made up of **microtubules**, and it is thought that these microtubules may pull the chromosomes toward the poles of the cell where the two daughter nuclei will eventually form. (It appears that centrioles are basal bodies that give rise to flagella and cilia in animals and lower plants such as mosses and ferns. Centrioles are not found in nonflagellated "higher" plants such as angiosperms.) (Figure 3.3).

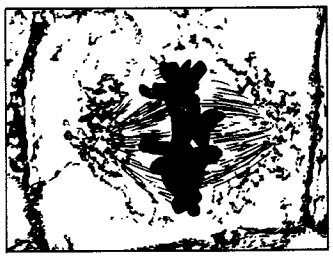
Figure 3.3



Prophase

3. At **metaphase**, the chromosomes have moved to the center of the spindle. One particular portion of each chromosome, the centromere, attaches to the spindle. The centromeres of all the chromosomes lie at about the same level of the spindle, on an imaginary plane called the **metaphase plate**. At metaphase you should be able to observe the two chromatids of some of the chromosomes (Figure 3.4).

Figure 3.4



Metaphase

4. At the beginning of **anaphase**, the centromere regions of each pair of chromatids separate and are moved by the spindle fibers toward opposite poles of the spindle, dragging the rest of the chromatid behind them. Once the two chromatids separate, each is called a chromosome. The daughter chromosomes continue poleward movement until they form two compact clumps, one at each spindle pole (Figure 3.5).

Figure 3.5

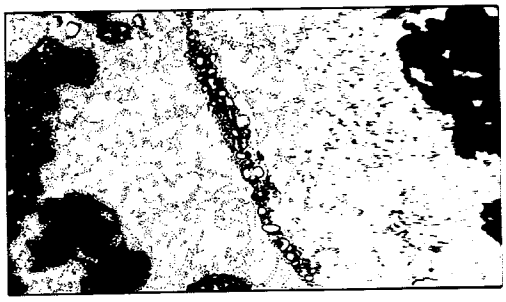
Anaphase

5. **Telophase**, the last stage of division, is marked by a pronounced condensation of the chromosomes, followed by the formation of a new nuclear envelope around each group of chromosomes (Figure 3.6). The chromosomes gradually uncoil to form the fine chromatin network of interphase, and the nucleoli and nuclear envelope reappear. The cell develops into two new cells. In plants, a new cell wall is laid down between the daughter cells (Figure 3.7). In animal cells, the old cell will pinch off in the middle to form two new daughter cells (Figure 3.8). This division of the cytoplasm, in contrast to nuclear division (mitosis), is called **cytokinesis**.

Figure 3.6

Telophase

Figure 3.7



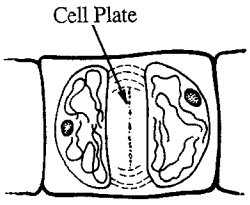
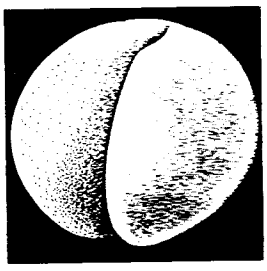


Figure 3.8



EXERCISE 3A.2: Relative Lengths of Mitotic Stages in the Onion Root Tip

To estimate the relative length of the time that a cell spends in the various stages of mitosis, you will examine the meristematic region of a prepared slide of the onion root tip.

Procedure

1. Using the low-power objective (10X), locate the meristematic region. Shift to the high-power objective (40X), and tabulate the number of cells that are in each stage of mitosis (prophase, metaphase, anaphase, and telophase).
2. Repeat this count in at least two more nonoverlapping fields of view.
3. Record the data in Table 3.1.

Table 3.1

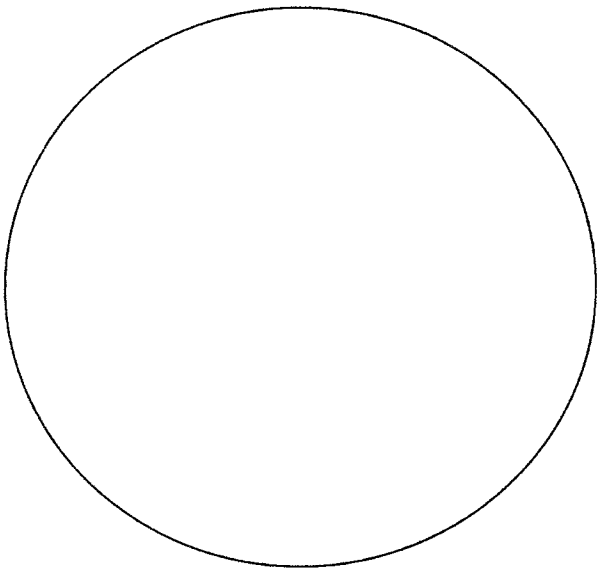
	Number of Cells				Percent of Total Cells Counted
	Field 1	Field 2	Field 3	Total	
Prophase					
Metaphase					
Anaphase					
Telophase					
			Total Cells Counted		

Questions →

Questions:

1. Based on your data, describe the amount of time a cell spends in each phase of the cell cycle.

2. Based on your data, make a pie graph below. Make sure to write the percentages and names of each phase.



3. What is the difference between Mitosis & Cytokinesis?

4. How does Cytokinesis differ in plants & animals?

5. Why do you think animals have centrioles but plants do not?